Soil Fertility for Urban Settings

Frank Mangan, PhD

STOCKBRIDGE
SCHOOL of AGRICULTURE

UMASS
AMHERST

Soil fertility

- The first four chapters in Building Betters Soils for Better Crops is relevant to these lectures - http://www.sare.org/Learning-Center/Books/Building-Soils-for-Better-Crops-3rd-Edition
- New England Vegetable Management Guide
- https://nevegetable.org/
  - Fundamentals of Soil Fertility
  - Plant nutrients
  - Soil Health
  - Guidelines for Organic fertility management
  - Soil testing

- **UMass Soil and Tissue Testing Lab**
- http://soiltest.umass.edu/

New England

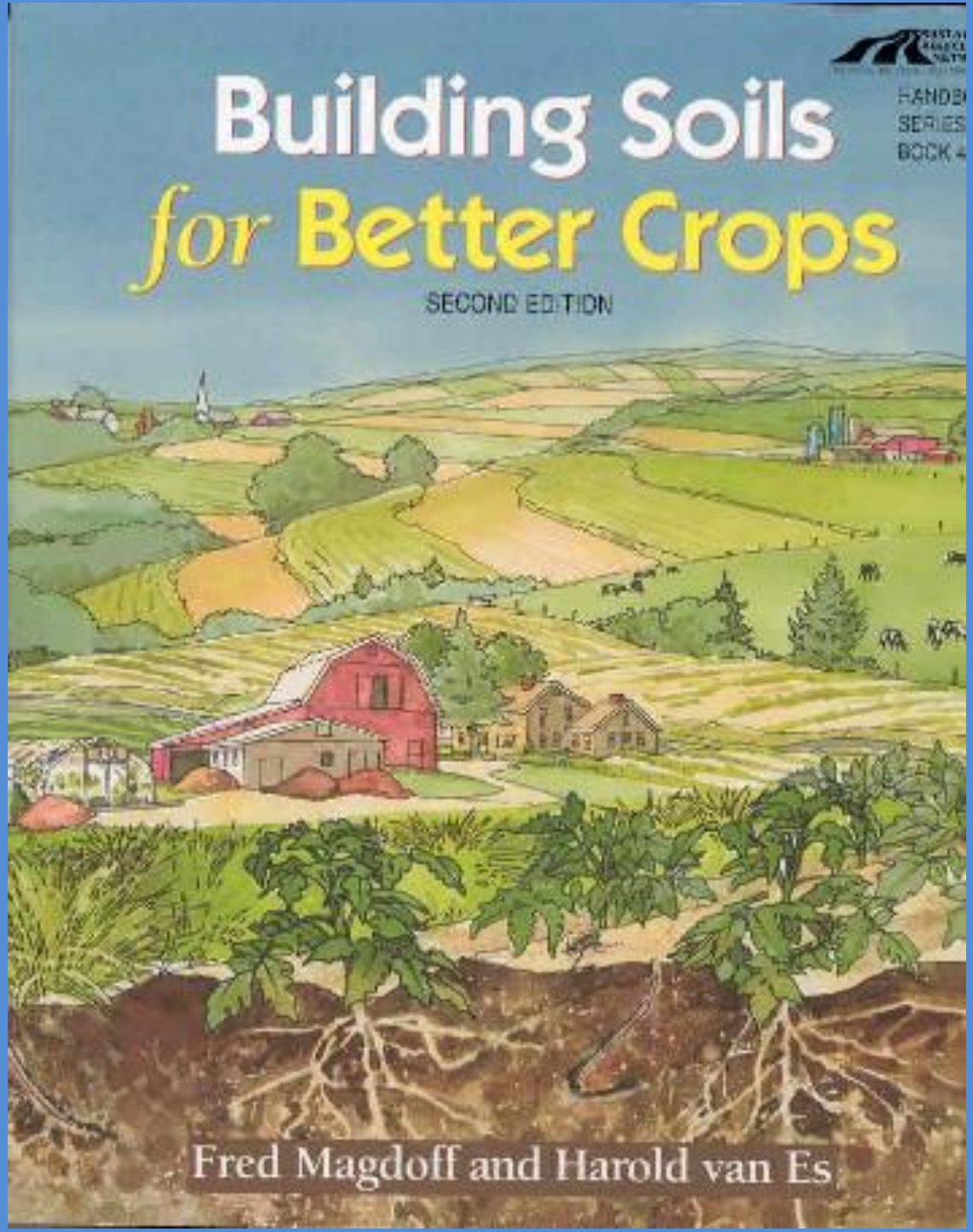
Vegetable Management Guide

2016-2017 Edition

UMass Extension

Vegetable Crop Production
from Seed to Harvest

UCONN · MAINE · University of New Hampshire Cooperative Extension · THE UNIVERSITY OF RHODE ISLAND · The University of Vermont


Building Soils
for Better Crops
SECOND EDITION
Fred Magdoff and Harold van Es

Submit a test

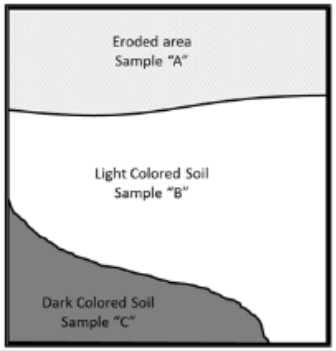
Soil and Plant Tissue Testing Laboratory
203 Paige Laboratory
161 Holdsworth Way
University of Massachusetts
Amherst, MA 01003

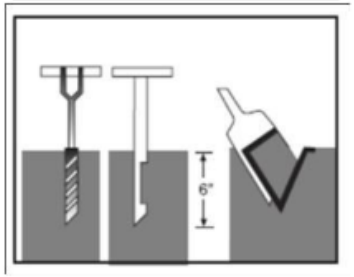
Phone: (413) 545-2311
email: soiltest@umass.edu
website: http://soiltest.umass.edu/


West Experiment Station

Soil Sampling Instructions

The most critical step in soil testing is collecting the sample. It is important that you take the necessary steps to obtain a representative sample; a poor sample could result in erroneous recommendations.





The first step is to determine the area that will be represented by the sample. Soil physical appearance, texture, color, slope, drainage, and past management should be similar throughout the area. It may be helpful to draw a map of the property and identify areas where you will collect samples. Using a clean bucket and a spade, auger, or sampling tube collect 12 or more subsamples to a depth of six to eight inches (four to six inches for turf) from random spots within the defined area. Avoid sampling field or plot edges and other non-representative areas. Avoid sampling when the soil is very wet or within six to eight weeks after a lime or fertilizer application.

Next, break up any lumps or clods of soil, remove

information under "Send copy to." Enter your Sample ID using the same name you labeled your samples with. Please include the approximate area represented by each sample. This information is useful to the lab and will be reported with your results. A rough approximation is adequate (i.e., +/- 1000 square feet for turf or +/- one acre for row crops).

Be sure to specify a Crop Code for each sample; without a Crop Code, the lab cannot provide lime and nutrient recommendations. Crop codes are listed on the second page of the submission forms. Finally select any optional tests you would like in addition to routine soil analysis. A brief description of these is proved below.

Send your sample(s), completed submission form and payment to the address listed on the front. Enclose check payable to UMass with your order. Please include $2 for postage and handling if you would like your results sent by US Mail.

Soil Test Descriptions & Fees

Routine Soil Analysis

Standard fertility test: $15.00
Includes pH, acidity, Modified Morgan extractable nutrients (P, K, Ca, Mg, Fe, Mn, Zn, Cu, B), lead, and aluminum, cation exchange capacity, and percent base saturation. Recommendations for nutrient and pH adjustment are included with results.

Optional Additional Soil Analysis

Soil organic matter: $ 6.00

UMass Extension

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USE THIS FORM FOR HOME GROUNDS AND GARDENS

Visit our website to download a copy of the Sampling Instructions sheet which includes a description of routine, and optional soil tests offered. Send your sample(s), completed submission form and payment to the address listed above. Enclose check payable to UMass for $15 for each sample plus additional fees for optional tests requested below.

Main contact:	Send copy to:	Method of receiving results
Name:	Name:	❑ US Mail (please include $2 for postage & handling)
Business Name:	Business Name:	
Street Address:	Street Address:	❑ E-mail
City, State, and Zip	City, State, and Zip	
Phone:	Phone:	
E-mail address:	E-mail address:	

LAB # (Leave blank)	Sample ID (You create this)	Approx. area represented by sample (sq ft. or acres)	Crop Code, limit of 3 (See reverse side of this form)	Routine analysis ($15.00)	Organic matter ($6.00)	Soluble salts ($6.00)	Nitrate ($6.00)
				☑	❑	❑	❑
				☑	❑	❑	❑
				☑	❑	❑	❑
				☑	❑	❑	❑
				☑	❑	❑	❑
				☑	❑	❑	❑

Office Use Only	
Received	Due
Check#	PO#
Cash	

Order Total $ _____

Crop Codes

Lime and nutrient recommendations are provided on your test report specifically for the crop code(s) you identify on your soil sample submission form and are based on the analytical results for your sample. Crop Codes for home grounds and gardens are listed below. Select the crop code that best describes your management objectives.

Home Lawns

Description	Crop Code
Lawn-Establishment	HA1
Lawn-Maintenance	HA2

Home Gardens, Trees and Shrubs

Description	Crop Code
Flowers, Roses, & Herbs	HB3E
Home Vegetable Garden (mixed)	HB1
Home Blueberries-Establishment	HD1E
Home Blueberries-Maintenance	HD1M
Home Brambles-Establishment	HD2E
Home Brambles-Maintenance	HD2M
Home Strawberries-Establishment	HD3E
Home Strawberries-Maintenance	HD3M
Home Grapes, American Varieties-Establishment	HD4E
Home Grapes, American Varieties-Maintenance	HD4M
Home Grapes, European Varieties-Establishment	HD5E
Home Grapes, European Varieties-Maintenance	HD5M
Deciduous Trees, Shrubs & Vines-Establishment	HC1E
Deciduous Trees, Shrubs & Vines-Maintenance	HC1M
Needleleaf Trees & Shrubs-Establishment	HC2E
Needleleaf Trees & Shrubs-Maintenance	HC2M
Acid-loving Trees, Shrubs, & Groundcover-Establishment	HC3E
Acid-loving Trees, Shrubs, & Groundcover –Maintenance	HC3M

Interpret results - contaminants

- Fact sheets
- **How and Why to Measure Soil Contaminants in Urban Settings**
- **http://soiltest.umass.edu/sites/soiltest.umass.edu/files/fact-sheets/pdf/SPTTL_12%20Soil%20Contaminants.pdf**
- **Soil Lead: Testing, Interpretation, & Recommendations**
- **http://soiltest.umass.edu/fact-sheets/soil-lead-testing-interpretation-recommendations**

Soil Lead Levels, Distribution, and Sampling Procedures used by the UMass Soil Testing Lab to screen soils for lead contamination are the same ones used for routine measurement of plant nutrients. The Modified Morgan extracting solution, dilute glacial acetic acid and ammonium hydroxide, removes a reproducible fraction of the total soil lead. The "extractable" lead is a measure of the reactive lead in the soil. A correlation between extractable lead and ESTIMATED TOTAL LEAD has been determined by testing a large number of soils (>300) using both the routine extraction procedure and a more rigorous total soil digestion. Information derived from a variety of sources has resulted in classifying soil lead levels as follows:

Lead Level	Extracted Lead	*Estimated Total Lead
	----------mg/kg or ppm----------	
Low	**less than 22**	**less than 299**
Medium	**22 to 126**	**300 to 999**
High	**127 to 293**	**1000 to 2000**
Very High	**greater than 293**	**greater than 2000**

The listed categories are those of the UMass Soil Testing Lab. They are meant to correspond to the recommendations listed below. ***If Estimated Total Lead levels are above 300 ppm, young children and pregnant women should avoid contact with the soil. Estimated Total Lead Levels above 2000 ppm are considered a concern for all users and may represent a hazardous waste situation.*** Contact your state's Department of Environmental Protection or your local health department for more information.

Soil pH

- Optimum availability between 6.6 – 7.0
- Blueberries

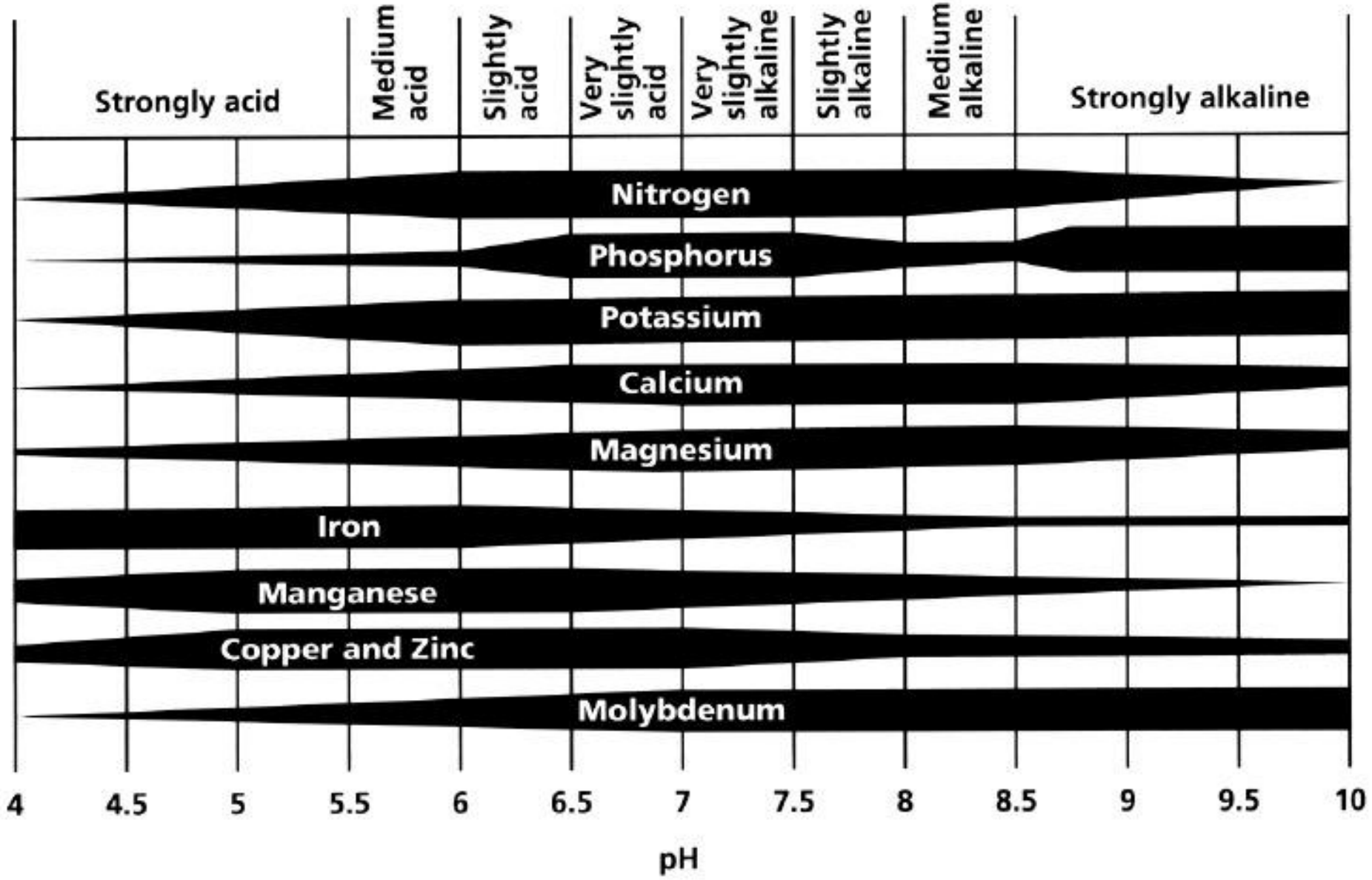

FIGURE 1. The availability of a number of ions in the soil as dependent on soil pH.

Soil and Plant Tissue Testing Laboratory
203 Paige Laboratory
161 Holdsworth Way
University of Massachusetts
Amherst, MA 01003
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e-mail: soiltest@umass.edu
website: soiltest.umass.edu

Soil Test Report

Prepared For:

Customer Name
Company Name
Street Address
City, State Zip

name@email.com
555-123-4567

Sample Information:

Sample ID: Garden

Order Number: 19743
Lab Number: S160229-122
Area Sampled:
Received: 2/29/2016
Reported: 3/3/2016

Results

Analysis	Value Found	Optimum Range
Soil pH (1:1, H2O)	6.1	
Modified Morgan extractable, ppm		
Macronutrients		
Phosphorus (P)	3.2	4-14
Potassium (K)	125	100-160
Calcium (Ca)	1791	1000-1500
Magnesium (Mg)	358	50-120
Sulfur (S)	16.1	>10
Micronutrients *		
Boron (B)	0.2	0.1-0.5
Manganese (Mn)	9.3	1.1-6.3
Zinc (Zn)	1.2	1.0-7.6
Copper (Cu)	0.6	0.3-0.6
Iron (Fe)	5.8	2.7-9.4
Aluminum (Al)	10	<75
Lead (Pb)	0.3	<22

Analysis	Value Found	Optimum Range
Cation Exch. Capacity, meq/100g	17.0	
Exch. Acidity, meq/100g	4.8	
Base Saturation, %		
Calcium Base Saturation	53	50-80
Magnesium Base Saturation	17	10-30
Potassium Base Saturation	2	2.0-7.0
Scoop Density, g/cc	0.99	

* *Micronutrient deficiencies rarely occur in New England soils; therefore, an Optimum Range has never been defined. Values provided represent the normal range found in soils and are for reference only.*

Soil Test Interpretation

Nutrient	Very Low	Low	Optimum	Above Optimum
Phosphorus (P):				
Potassium (K):				
Calcium (Ca):				
Magnesium (Mg):				

Results

Analysis	Value Found	Optimum Range
Soil pH (1:1, H2O)	6.1	
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Calcium (Ca):				
Magnesium (Mg):				

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Recommendations for Home Vegetable (mixed)

Limestone (Target pH of 6.5)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 100 sq ft		
7.5	.25 - .3	0.25	0.1

Comments:

-For instructions on converting nutrient recommendations to fertilizer applications in home gardens, lawns and landscapes, see Reference "Step-by-Step Fertilizer Guide for Home Grounds and Gardening" (listed below).
-Do not topdress with more than 5 lb limestone per 100 sq ft at one time. Split the above application between early spring and mid-autumn.
-The lead level in this soil is LOW. For more information about lead levels in soil, see our Soil Lead Fact Sheet.

References:

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Results

Analysis	Value Found	Optimum Range	Analysis	Value Found	Optimum Range
Soil pH (1:1, H2O)	6.7		**Cation Exch. Capacity, meq/100g**	8.0	
Modified Morgan extractable, ppm			**Exch. Acidity, meq/100g**	1.0	
Macronutrients			**Base Saturation, %**		
Phosphorus (P)	2.7	4-14	Calcium Base Saturation	79	50-80
Potassium (K)	71	100-160	Magnesium Base Saturation	7	10-30
Calcium (Ca)	1268	1000-1500	Potassium Base Saturation	2	2.0-7.0
Magnesium (Mg)	65	50-120	**Scoop Density, g/cc**	1.00	
Sulfur (S)	26.9	>10	**Optional tests**		
Micronutrients *			Soil Organic Matter (LOI), %	6.3	
Boron	0.1	0.1-0.5			
Manganese (Mn)	2.2	1.1-6.3			
Zinc (Zn)	0.4	1.0-7.6			
Copper (Cu)	0.2	0.3-0.6			
Iron (Fe)	6.5	2.7-9.4			
Aluminum (Al)	117	<75			
Lead (Pb)	1.1	<22			

* *Micronutrient deficiencies rarely occur in New England soils; therefore, an Optimum Range has never been defined. Values provided represent the normal range found in soils and are for reference only.*

Soil Test Interpretation

Nutrient	Very Low	Low	Optimum	Above Optimum
Phosphorus (P):				
Potassium (K):				
Calcium (Ca):				
Magnesium (Mg):				

Recommendations for Pumpkins

Limestone (Target pH of 6.5)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / acre		
0	110 - 140	125	150

Comments:

Results

Analysis	Value Found	Optimum Range	Analysis	Value Found	Optimum Range
Soil pH (1:1, H2O)	6.7		**Cation Exch. Capacity, meq/100g**	8.0	
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Recommendations for Pumpkins

Limestone (Target pH of 6.5)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
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0	110 - 140	125	150

Comments:

Phosphorous and Potassium

Results

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Soil pH (1:1, H2O)	6.1	
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Phosphorus (P)	3.2	4-14
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Calcium (Ca)	1791	1000-1500
Magnesium (Mg)	358	50-120
Sulfur (S)	16.1	>10
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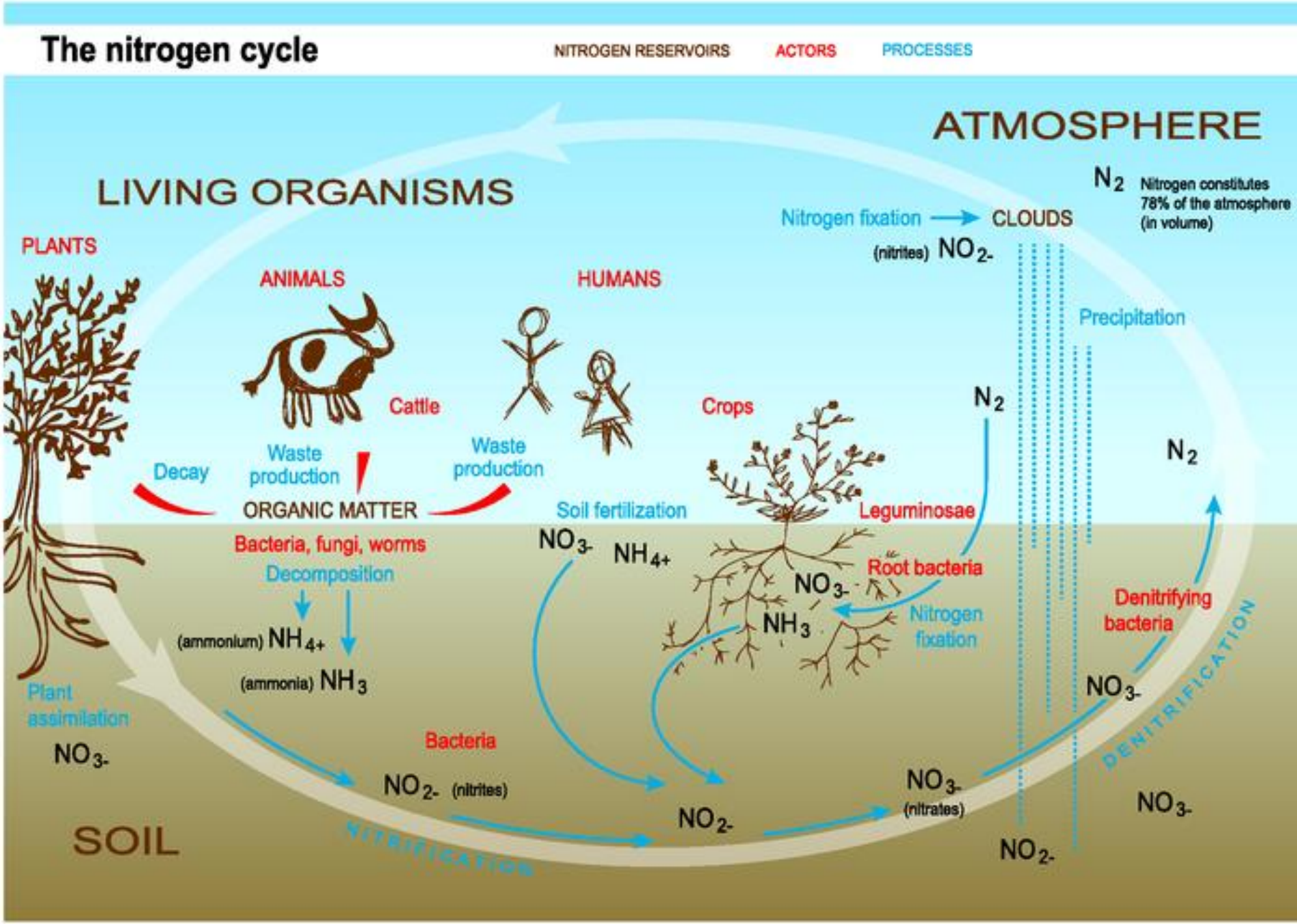
Nitrogen


The nitrogen cycle
NITROGEN RESERVOIRS
ACTORS
PROCESSES
ATMOSPHERE
LIVING ORGANISMS
N_2 Nitrogen constitutes 78% of the atmosphere (in volume)
Nitrogen fixation
CLOUDS
(nitrites) NO_{2-}
PLANTS
ANIMALS
HUMANS
Precipitation
Cattle
Crops
N_2
N_2
Decay
Waste production
Waste production
ORGANIC MATTER
Soil fertilization
Leguminosae
Bacteria, fungi, worms
NO_{3-} NH_{4+}
Root bacteria
Decomposition
NO_{3-}
NH_3
Nitrogen fixation
Denitrifying bacteria
(ammonium) NH_{4+}
(ammonia) NH_3
Plant assimilation
NO_{3-}
NO_{3-}
Bacteria
NO_{2-} (nitrites)
NO_{3-} (nitrates)
NO_{3-}
NO_{2-}
NO_{2-}
NITRIFICATION
DENITRIFICATION
SOIL

Ratio of soil OM to CEC in selected soil test results

CEC	SOIL OM	Ratio
6.3	2.5	0.40
6.4	2.7	0.42
19.1	8.0	0.42
4.9	1.8	0.37
7.6	3.7	0.49
7.5	3.1	0.43
14.4	7.7	0.53
5.4	2.3	0.43
6.5	2.4	0.37
5.9	2.5	0.42
5.7	2.3	0.41
5.5	2.1	0.38
4.2	1.9	0.45

Results

Analysis	Value Found	Optimum Range
Soil pH (1:1, H2O)	6.1	
Modified Morgan extractable, ppm		
Macronutrients		
Phosphorus (P)	3.2	4-14
Potassium (K)	125	100-160
Calcium (Ca)	1791	1000-1500
Magnesium (Mg)	358	50-120
Sulfur (S)	16.1	>10
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Zinc (Zn)	1.2	1.0-7.6
Copper (Cu)	0.6	0.3-0.6
Iron (Fe)	5.8	2.7-9.4
Aluminum (Al)	10	<75
Lead (Pb)	0.3	<22

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Base Saturation, %		
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Soil Test Interpretation

Nutrient	Very Low	Low	Optimum	Above Optimum
Phosphorus (P):				
Potassium (K):				
Calcium (Ca):				
Magnesium (Mg):				

- 17x 0.4 = 6.8
- More than 7% soil OM will provide enough nitrogen

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Soil Test Report

Prepared For:

Frank Mangan
UMass Extension
161 Holdsworth Way
Amherst, MA 01003

fmangan@umass.edu
508-254-3331

Sample Information:
Sample ID: Blue

Order Number: 14328
Lab Number: S150507-813
Area Sampled: 10 sq ft
Received: 5/7/2015
Reported: 5/29/2015

Results

Analysis	*Value Found*	*Optimum Range*
Soil pH (1:1, H2O)	5.3	
Modified Morgan extractable, ppm		
Macronutrients		
Phosphorus (P)	4.9	4-14
Potassium (K)	55	100-160
Calcium (Ca)	719	1000-1500
Magnesium (Mg)	63	50-120
Sulfur (S)	43.6	>10
Micronutrients *		
Boron (B)	0.2	0.1-0.5
Manganese (Mn)	5.5	1.1-6.3
Zinc (Zn)	2.0	1.0-7.6
Copper (Cu)	0.6	0.3-0.6
Iron (Fe)	7.5	2.7-9.4
Aluminum (Al)	117	<75
Lead (Pb)	1.0	<22

Analysis	*Value Found*	*Optimum Range*
Cation Exch. Capacity, meq/100g	8.2	
Exch. Acidity, meq/100g	3.9	
Base Saturation, %		
Calcium Base Saturation	44	50-80
Magnesium Base Saturation	6	10-30
Potassium Base Saturation	2	2.0-7.0
Scoop Density, g/cc	0.97	
Optional tests		
Soil Organic Matter (LOI), %	4.8	

* *Micronutrient deficiencies rarely occur in New England soils; therefore, an Optimum Range has never been defined. Values provided represent the normal range found in soils and are for reference only.*

Soil Test Interpretation

Nutrient	Very Low	Low	Optimum	Above Optimum
Phosphorus (P):				
Potassium (K):				
Calcium (Ca):				
Magnesium (Mg):				

Soil and Plant Tissue Testing Laboratory
203 Paige Laboratory
161 Holdsworth Way
University of Massachusetts
Amherst, MA 01003
Phone: (413) 545-2311
e-mail: soiltest@umass.edu
website: soiltest.umass.edu

Soil Test Report

Prepared For:

Frank Mangan
UMass Extension
161 Holdsworth Way
Amherst, MA 01003

fmangan@umass.edu
508-254-3331

Sample Information:
Sample ID: HRH-L

Order Number: 14190
Lab Number: S150505-224
Area Sampled:
Received: 5/5/2015
Reported: 5/27/2015

Results

Analysis	*Value Found*	*Optimum Range*
Soil pH (1:1, H2O)	7.3	
Modified Morgan extractable, ppm		
Macronutrients		
Phosphorus (P)	38.9	4-14
Potassium (K)	338	100-160
Calcium (Ca)	5000	1000-1500
Magnesium (Mg)	258	50-120
Sulfur (S)	49.9	>10
Micronutrients *		
Boron (B)	2.5	0.1-0.5
Manganese (Mn)	31.7	1.1-6.3
Zinc (Zn)	10.1	1.0-7.6
Copper (Cu)	1.1	0.3-0.6
Iron (Fe)	6.6	2.7-9.4
Aluminum (Al)	31	<75
Lead (Pb)	8.0	<22

Analysis	*Value Found*	*Optimum Range*
Cation Exch. Capacity, meq/100g	28.0	
Exch. Acidity, meq/100g	0.0	
Base Saturation, %		
Calcium Base Saturation	89	50-80
Magnesium Base Saturation	8	10-30
Potassium Base Saturation	3	2.0-7.0
Scoop Density, g/cc	1.05	
Optional tests		
Soil Organic Matter (LOI), %	9.2	

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Soil Test Interpretation

Nutrient	Very Low	Low	Optimum	Above Optimum
Phosphorus (P):				
Potassium (K):				
Calcium (Ca):				
Magnesium (Mg):				

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Soil Test Report

Prepared For:
Frank Mangan
UMass Extension
161 Holdsworth Way
Amherst, MA 01003

fmangan@umass.edu
508-254-3331

Sample Information:
Sample ID: HRH-R

Order Number: 14190
Lab Number: S150505-222
Area Sampled:
Received: 5/5/2015
Reported: 5/27/2015

Results

Analysis	*Value Found*	*Optimum Range*
Soil pH (1:1, H2O)	7.2	
Modified Morgan extractable, ppm		
Macronutrients		
Phosphorus (P)	23.1	4-14
Potassium (K)	210	100-160
Calcium (Ca)	3077	1000-1500
Magnesium (Mg)	155	50-120
Sulfur (S)	28.0	>10
Micronutrients *		
Boron (B)	1.3	0.1-0.5
Manganese (Mn)	16.8	1.1-6.3
Zinc (Zn)	14.0	1.0-7.6
Copper (Cu)	1.7	0.3-0.6
Iron (Fe)	6.6	2.7-9.4
Aluminum (Al)	33	<75
Lead (Pb)	21.5	<22

Analysis	*Value Found*	*Optimum Range*
Cation Exch. Capacity, meq/100g	17.2	
Exch. Acidity, meq/100g	0.0	
Base Saturation, %		
Calcium Base Saturation	89	50-80
Magnesium Base Saturation	7	10-30
Potassium Base Saturation	3	2.0-7.0
Scoop Density, g/cc	1.05	
Optional tests		
Soil Organic Matter (LOI), %	6.1	

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Soil Test Interpretation

Nutrient	Very Low	Low	Optimum	Above Optimum
Phosphorus (P):				
Potassium (K):				
Calcium (Ca):				
Magnesium (Mg):				

UMass Extension

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Soil and Plant Tissue Testing Laboratory
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Soil Test Report

Prepared For:

Sr. Catherine
Assumption Center
16 Vinyard St
Worcester, MA 01603

catherinesoley5@gmaill.com
508-767-1356

Sample Information:
Sample ID: 1

Order Number: 11491
Lab Number: S141210-110
Area Sampled: 32 sq ft
Received: 12/10/2014
Reported: 12/16/2014

Results

Analysis	*Value Found*	*Optimum Range*
Soil pH (1:1, H2O)	6.7	
Modified Morgan extractable, ppm		
Macronutrients		
Phosphorus (P)	105.1	4-14
Potassium (K)	249	100-160
Calcium (Ca)	6704	1000-1500
Magnesium (Mg)	728	50-120
Sulfur (S)	62.4	>10
Micronutrients *		
Boron (B)	2.0	0.1-0.5
Manganese (Mn)	16.6	1.1-6.3
Zinc (Zn)	14.7	1.0-7.6
Copper (Cu)	0.8	0.3-0.6
Iron (Fe)	7.5	2.7-9.4
Aluminum (Al)	17	<75
Lead (Pb)	5.8	<22

Analysis	*Value Found*	*Optimum Range*
Cation Exch. Capacity, meq/100g	42.1	
Exch. Acidity, meq/100g	2.0	
Base Saturation, %		
Calcium Base Saturation	80	50-80
Magnesium Base Saturation	14	10-30
Potassium Base Saturation	2	2.0-7.0
Scoop Density, g/cc	0.76	
Optional tests		
Soil Organic Matter (LOI), %	19.3	

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Soil Test Interpretation

Nutrient	Very Low	Low	Optimum	Above Optimum
Phosphorus (P):				
Potassium (K):				
Calcium (Ca):				
Magnesium (Mg):				

Phosphorus is excessive!!!

Micronutrients

Results

Analysis	Value Found	Optimum Range
Soil pH (1:1, H2O)	6.1	
Modified Morgan extractable, ppm		
Macronutrients		
Phosphorus (P)	3.2	4-14
Potassium (K)	125	100-160
Calcium (Ca)	1791	1000-1500
Magnesium (Mg)	358	50-120
Sulfur (S)	16.1	>10
Micronutrients *		
Boron (B)	0.2	0.1-0.5
Manganese (Mn)	9.3	1.1-6.3
Zinc (Zn)	1.2	1.0-7.6
Copper (Cu)	0.6	0.3-0.6
Iron (Fe)	5.8	2.7-9.4
Aluminum (Al)	10	<75
Lead (Pb)	0.3	<22

Analysis	Value Found	Optimum Range
Cation Exch. Capacity, meq/100g	17.0	
Exch. Acidity, meq/100g	4.8	
Base Saturation, %		
Calcium Base Saturation	53	50-80
Magnesium Base Saturation	17	10-30
Potassium Base Saturation	2	2.0-7.0
Scoop Density, g/cc	0.99	

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Soil Test Interpretation

Nutrient	Very Low	Low	Optimum	Above Optimum
Phosphorus (P):				
Potassium (K):				
Calcium (Ca):				
Magnesium (Mg):				

Results

Analysis	Value Found	Optimum Range
Soil pH (1:1, H2O)	6.7	
Modified Morgan extractable, ppm		
Macronutrients		
Phosphorus (P)	2.7	4-14
Potassium (K)	71	100-160
Calcium (Ca)	1268	1000-1500
Magnesium (Mg)	65	50-120
Sulfur (S)	26.9	>10
Micronutrients *		
Boron	0.1	0.1-0.5
Manganese (Mn)	2.2	1.1-6.3
Zinc (Zn)	0.4	1.0-7.6
Copper (Cu)	0.2	0.3-0.6
Iron (Fe)	6.5	2.7-9.4
Aluminum (Al)	117	<75
Lead (Pb)	1.1	<22

Analysis	Value Found	Optimum Range
Cation Exch. Capacity, meq/100g	8.0	
Exch. Acidity, meq/100g	1.0	
Base Saturation, %		
Calcium Base Saturation	79	50-80
Magnesium Base Saturation	7	10-30
Potassium Base Saturation	2	2.0-7.0
Scoop Density, g/cc	1.00	
Optional tests		
Soil Organic Matter (LOI), %	6.3	

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Soil Test Interpretation

Nutrient	Very Low	Low	Optimum	Above Optimum
Phosphorus (P):				
Potassium (K):				
Calcium (Ca):				
Magnesium (Mg):				

Recommendations for Pumpkins

Limestone (Target pH of 6.5)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / acre		
0	110 - 140	125	150

Comments:

Results

Analysis	Value Found	Optimum Range
Soil pH (1:1, H2O)	6.1	
Modified Morgan extractable, ppm		
Macronutrients		
Phosphorus (P)	3.2	4-14
Potassium (K)	125	100-160
Calcium (Ca)	1791	1000-1500
Magnesium (Mg)	358	50-120
Sulfur (S)	16.1	>10
Micronutrients *		
Boron (B)	0.2	0.1-0.5
Manganese (Mn)	9.3	1.1-6.3
Zinc (Zn)	1.2	1.0-7.6
Copper (Cu)	0.6	0.3-0.6
Iron (Fe)	5.8	2.7-9.4
Aluminum (Al)	10	<75
Lead (Pb)	0.3	<22

Analysis	Value Found	Optimum Range
Cation Exch. Capacity, meq/100g	17.0	
Exch. Acidity, meq/100g	4.8	
Base Saturation, %		
Calcium Base Saturation	53	50-80
Magnesium Base Saturation	17	10-30
Potassium Base Saturation	2	2.0-7.0
Scoop Density, g/cc	0.99	

* *Micronutrient deficiencies rarely occur in New England soils; therefore, an Optimum Range has never been defined. Values provided represent the normal range found in soils and are for reference only.*

Soil Test Interpretation

Nutrient	Very Low	Low	Optimum	Above Optimum
Phosphorus (P):				
Potassium (K):				
Calcium (Ca):				
Magnesium (Mg):				